Fractal Harmonic Field Theory - Page 45: 3D and Curved Spacetime Generalization

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We now extend the field from 1+1D flat spacetime to full 3+1D curved spacetime, enabling predictions of real gravitational phenomena.

1. Field Definition in 3D:

   (t, x) = sin(k x + a sin(bt)),

   where x = (x, y, z) and k is a spatial wavevector.

2. CurvedSpace Wave Equation:

   Using the metric g_{}, define the covariant d'Alembertian:

    _g = (1/|g|) _ (|g| g^{} _) = 0.

3. 4D Lagrangian Density:

    = g^{} _ _ - m^2 ^2 - (/4) ^4.

4. EnergyMomentum Tensor:

   T_{}^{()} = _ _ - g_{} [g^{} _ _ - m^2 ^2 - (/4) ^4].

5. Einstein Field Equations:

   G_{} + g_{} = 8G (T_{}^{(matter)} + T_{}^{()}).

6. Entropic Force in 3D:

   F_ = (^2),

with defined on spatial slices of the metric.

7. Metric Perturbation:

In weakfield limit g_{} = _{} + h_{}(^2),

solving linearized Einstein equations for h_{} sourced by ^2.

Conclusion:

This 3+1D generalization fully integrates the harmonic entropy field into general relativity, allowing computation of lensing, orbit perturbations, and tidal effects sourced by ^2.